Tokyo, November 30, 1996

DECLARATION

I, Shoji SUZUKI, of 4-20, Kashiwanoha 3-chome, Kashiwa City, Chiba Prefecture, do hereby solemnly and sincerely declare:

That I translated the attached Japanese language document into the English language;

And

That the attached English language translation is a true and correct translation of the attached
"Patent Application Disclosure No.54-145860"
to the best of my knowledge and belief.

Shoji Suzuki

(Shoji SUZUKI)

(19) Jap. Patent Office(JP)

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(54) Title: FLUID TYPE TORQUE CONVERTER WITH DIRECT-COUPLED CLUTCH

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(22) Application date: May 8, 1978

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Fair copying of Specification

(No change in the contents)

Specification

1. TITLE OF THE INVENTION

FLUID TYPE TORQUE CONVERTER WITH DIRECT-COUPLED CLUTCH

2. CLAIM:

In a fluid type torque converter comprising a housing which is an input member for connecting an engine output shaft to a pump, a turbine fluid-dynamically connected to said pump to transit power to the output shaft, a stator for refluxing a fluid from said turbine to said pump, and a one-way clutch for limiting the rotational direction of said stator to a unidirection, a fluid type torque converter with a direct-coupled clutch characterized by comprising an annular piston carried on said output shaft, installed between said housing and said piston and having a frictional member on the housing side, an annular hub secured to an outer peripheral shoulder of said turbine and having elastic members provided in a plurality of holes on the circumference, two annular plates which engage both surfaces of said hub and having a hole into which is inserted a part of said elastic members, an annular spring retaining member arranged on a back surface of one of said annular plates through a plurality of springs, and a plurality of rivets passed through holes disposed between said holes of said hub and for fastening said piston, said plates and said spring retaining member in a row.

3. DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a fluid type torque converter with a direct-coupled clutch, and particularly to a mechanism of the direct-coupled clutch. Generally, the torque converter comprises a pump engaged with an output shaft of an engine, a turbine engaged with an auxiliary speed change gear, and a stator for deflecting a flow of fluid returning from the turbine to the pump to suitably convert the torque, wherein power is transmitted through the fluid while performing the suitable torque conversion according to a difference in rotational speed between the output shaft of the engine and the input shaft of the auxiliary speed change gear.

In the torque converter described above, even in the state in which the turbine rotational speed is closest to the pump rotational speed, there is inevitably present a slide between the pump and the turbine. Because of this, the power transmission efficiency lowers as compared with the direct-coupled transmission mechanism by way of a mechanical clutch, and as a result, the fuel consumption rate of a motor vehicle increases accordingly, thus posing a problem in that a considerable disadvantage is brought forth in view of the saving of resources and the measures for purifying exhaust gases.

In connection with the problem as noted above, an object of the present invention is to provide a fluid type torque converter with a direct-coupled clutch having a mechanism without much increasing an axial size of the fluid type torque converter and for absorbing the torque variations of the engine.

This object is achieved by, in a fluid type torque converter comprising a housing which is an input member for connecting an engine output shaft to a pump, a turbine fluid-dynamically

connected to said pump to transit power to the output shaft, a stator for refluxing a fluid from said turbine to said pump, and a one-way clutch for limiting the rotational direction of said stator to a unidirection, a fluid type torque converter with a direct-coupled clutch characterized by comprising an annular piston carried on said output shaft, installed between said housing and said piston and having a frictional member on the housing side, an annular hub secured to an outer peripheral shoulder of said turbine and having elastic members provided in a plurality of holes on the circumference, two annular plates which engage both surfaces of said hub and having a hole into which is inserted a part of said elastic members, an annular spring retaining member arranged on a back surface of one of said annular plates through a plurality of springs, and a plurality of rivets passed through holes disposed between said holes of said hub for fastening said piston, said plates and said spring retaining member in a row.

The present invention will be described in detail by way of embodiments with reference to the accompanying drawings.

In Fig. 1 showing in sectional view a preferred embodiment of the present invention, reference numeral 1 designates a rear end portion of an engine output shaft, and a flywheel 2 is mounted at the rear end portion by means of a plurality of bolts 3. The flywheel 2 is connected to a housing generally indicated by reference numeral 5 by means of a plurality of bolts 4, the engine output shaft 1, the flywheel 2 and the housing 5 being integrally rotated around an axis X-X. The housing 5 houses a main portion of the fluid type torque converter with a direct-coupled clutch and itself also constitutes a main transmission element, the housing 5 being constituted to be

rotatably driven around the axis X-X with the engine output shaft 1 as an input shaft thereof. The housing 5 comprises a forward end wall portion 6 coupled to the flywheel 2 by means of the bolts 4 as mentioned above and a pump housing portion 9 positioned at the rear thereof and constituting a pump 8 for the fluid type torque converter generally indicated at 7.

The torque converter 7 includes a turbine 10 and a stator 11 as is known. The turbine 10 is provided with a turbine disk 12 having an axially obliquely extending-though communication hole 40 on the same circumference, the turbine disk being axially slidable mounted through a spline 14 on an output shaft 13 extending along the axis X-X. The front end portion (the left side in the figure) of the output shaft 13 is liquid-tightly engaged when direct-coupled through an oil seal 16 with an inverted T-shaped portion of a piston 15 through a hub 21 described later mounted on the end wall portion 6 of the housing, and the rear end portion (the right end portion in the figure) thereof is constituted as an input shaft of a planet gear speed change mechanism of an auxiliary speed change gear not shown. A circumferential groove 41 in the outer periphery of the hub 21 houses an oil seal 16 which is rectangular in section, the circumferential groove 41 having the width sufficiently larger than the (axial) width of a rectangular section of the oil seal 16, the circumferential groove 41 having the depth sufficiently larger in size than the thickness of the rectangular section, the circumferential groove 41 having the bottom communicated with a plurality of holes 42 provided in the same circumference on the turbine disk side of the hub 21. The circumferential groove 41, the holes 42 and the communication hole 40 of the turbine disk 12 guide oil pressure between the turbine 10 and the stator. A stator shaft 17 is provided around

the output shaft 13, the stator shaft 17 being supported by an outer housing (not shown) secured to and retained by a vehicle body at the rear end portion (the right end portion in the figure) thereof. The stator 11 is mounted rotatably in a unidirection through a one-way clutch 18 on the stator shaft 17. The rear end portion of the housing 9 constituting the pump 8 is connected to a pump shaft 20 constituted as a hollow shaft of an oil pump 19, and the oil pump is driven by the rotation thereof.

In the fluid type torque converter constructed as described above, secured to the annular piston 15 carried on the output shaft 13 through the hub 21 is an annular frictional member 23 having the outside diameter providing a fixed clearance relative to the inside diameter of the end wall portion 6 of the housing and having a fixed width externally of the end wall portion 6 of the housing. The space defined between the housing 5 and the inside of the circular torque converter 7 by the piston 15 is divided into a chamber A positioned on one side (left side in the figure) of the piston and a chamber B positioned on the other side (right side in the figure) thereof. A hub 26 having springs 25 mounted in a plurality of holes 24 on the circumference is welded to the outer circumferential left-hand upper portion (shoulder) of the turbine 10, as will be described later. Engaged (there is a void in part) annular plates 27 and 28 are arranged on both sides of the hub 26, and power is also transmitted even through a spring 25 inserted into a hole 29 provided in the plate 27. One plate 28 is engaged with the hub and secured to the back position of the frictional member 23 of the piston 22 whereas the other plate is engaged with an annular spring retaining member 43 through springs.

Fig. 2 is a part of the direct-coupled clutch as viewed from A-A

of Fig. 1.

A plurality of holes 24 are tangentially provided in a fixed circumference of the hub 26. Both ends of the hole 24 are vertical, and a spring 25 is tangentially provided within the hole.

A plurality of rivet holes 30 through which rivets extend which will be described later are provided between the holes 24. This is a rectangular hole having a circumferential size and a normal size of the hub 26 sufficiently larger than the diameter of the rivet, and in the direct-coupled state, the rivet 31 engages vertically of the rivet hole. A frictional member 32 described later is pressed radially downwardly of the rivet hole.

Fig. 3 is a sectional view as viewed from B-B of the direct-coupled clutch shown in Fig. 2. As shown, the piston 15, the plates 27, 28 and the spring retaining member 43 are connected by a plurality of rivets 31 in that arrangement, and further, as shown in Fig. 4 which is a section as viewed from C-C of Fig. 3, the spring retaining member 43 is retained on the inside diameter of the rivet 31 by a rivet 45 in order to present a plurality of leaf springs 44 on one and the same circumference between it and the plate 27. Frictional members 32 and 33 of the hub are firmly pressed by means of the plates 27 and 28, and the force of the leaf springs 44 acts so that the piston 15 is always pulled rightward in Fig. 3 through the spring retaining member 43 and the rivet 31 and acts so as to prevent the piston 15 from contacting the housing 6. Further, the connection of the plates 27 and 28 and the hub 26 is made not by a mere connection of a coil spring 25 but through the frictional members 32 and 33 to thereby impart hysteresis to the

characteristic of the coil spring to apply the damping action so as to render the transmission of the power of the piston 22 and the turbine 10 smooth.

With the construction as described above, normally, an oil passage 34 between the stator shaft 17 and the output shaft 13 from a hydraulic control unit not shown is opened to supply the oil pressure to the chamber A to provide the disengagement between the housing 5 and the piston 15 as shown in Fig. 1 so that the power from the engine output shaft 1 is transmitted to the auxiliary speed change gear through the pump 8, the turbine 10 and the output shaft 13. The oil supplied to the chamber A passes between the housing 6 and the frictional member 23 and is supplied between the pump 8 and turbine, and supplied between the turbine 10 and the stator 11 through the circumferential groove 41, the hole 42 and the communication hole 40, as shown in Fig. 1, to thereby secure the flow rate of fluid which circulates the converter 7 when not direct-coupled.

Further, when oil pressure is supplied through the oil passage 35 between the stator shaft 17 and the pump shaft 20 for driving the pump 19 from the hydraulic control unit, the oil having been supplied to the chamber A is discharged through the oil passage 34. At this time, the piston 15 is moved leftward due to the force caused by the deformation of the turbine leftward in Fig. 1 and the pressure difference between the chamber A and the chamber B so that the frictional member 23 of the piston 15 engages the housing 6 whereby the power from the engine output shaft 1 is transmitted to the output shaft 13 through the piston 15, the hub 26 and the turbine 10.

As described above, according to the present invention, the hub

26 which is the connecting member of the direct-coupled clutch device to the turbine is provided on the outer peripheral shoulder of the turbine whereby the direct-coupled clutch device is provided between the housing which is the input member of the fluid type torque converter and the outer peripheral shoulder of the turbine to thereby enable the compact arrangement without much lengthening the axial size.

Further, the plate engaged with the both surfaces of the piston hub 26 and the spring member for retaining the spring for pressing the plates are connected in a row by means of the rivets whereby in the state in which the direct-coupled clutch device is shifted from operation to release (switching of a supply of oil pressure from the oil passage 35 to 34 by the oil pressure control device), the piston requires no movement of the hub secured to the turbine in the right direction of the shaft, and the springs connected to the spring retaining member integrated by the piston and the rivets become flexed whereby engagement and disengagement between the housing and the frictional member secured to the piston is secured at a timing earlier than the rise of oil pressure in the chamber A to quickly release the direct-coupled clutch device, which is advantageous with respect to the shock during the speed changing.

Moreover, as shown in Figs. 5 and 6, the spring 44 and the spring retaining member 43 shown in Figs. 3 and 4 can be substituted by an integrally formed annular spring retaining member 46. That is, as shown in Fig. 6, spring elements 47 for elastic operation are equidistantly formed in the inner periphery of the annular spring retaining member 46 whereby in the state in which the direct-coupled clutch device is shifted

from operation to release, the piston requires no movement of the hub secured to the turbine in the right direction of the shaft, and the spring elements integrated by the piston and the rivets become flexed whereby engagement and disengagement between the housing and the frictional member secured to the piston is secured at a timing earlier than the rise of oil pressure in the chamber A to quickly release the direct-coupled clutch device, which is advantageous with respect to the shock during the speed changing.

4. BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view of a fluid type torque converter with a direct-coupled clutch according to the present invention.

Fig. 2 is a sectional view taken on A-A of Fig. 1.

Fig. 3 is a sectional view taken on B-B of Fig. 2.

Fig. 4 is a sectional view taken on C-C of Fig. 3.

Fig. 5 shows a further embodiment of the present invention

Fig. 6 is a fragmentary perspective view of a spring retaining member.

1	engine
6	housing
8	pump
10	turbine
11	stator
13	output shaft
15	piston
25	spring
26	hub
27, 28	plate

31 rivet

43, 46 spring retaining member

Applicants: TOYOTA MOTOR Corporation

Representative: Shoichiro Toyota

Fig. 1

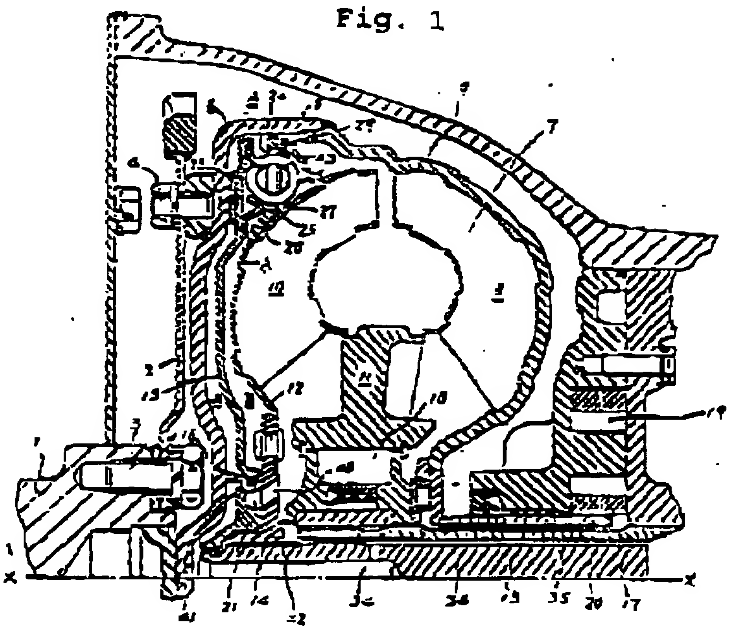


Fig. 4

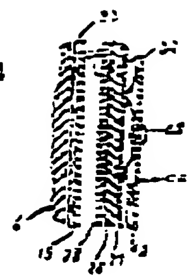


Fig. 3

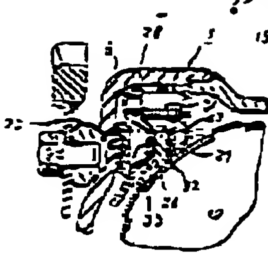


Fig. 2

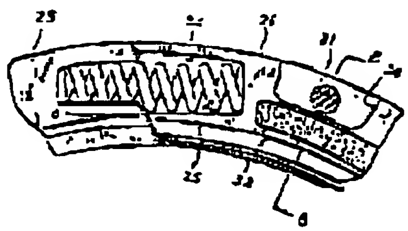


Fig. 5

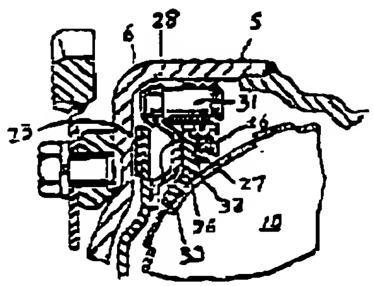
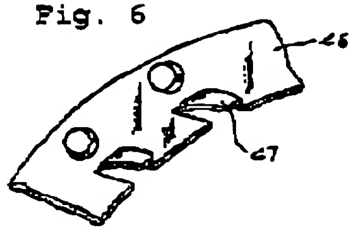


Fig. 6



Amendment (in form)

August 8, 1978

To: Mr. Zenji Kumagai,
President of Patent Office

1. Case: Patent Application No. 53-54638

2. Title: " FLUID TYPE TORQUE CONVERTER WITH DIRECT-COUPLED CLUTCH"

3. Amender

Relation with the Case: Patent Applicant

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Representative: Shoichiro Toyota

4. Date of Order for Amendment:
July 1, 1978 (despatched on July 25, '78)

5. Object of Amendment:
Application, Specification, Drawings

6. Details of Amendment:
Fair copying of Application, Specification, Drawings
(No change in the contents)